Subterranean Biology 43: 73–95 (2022)
doi: 10.3897/subtbiol.43.76049
https://subtbiol.pensoft.net

RESEARCH ARTICLE

A peer-reviewed open-access journal
Subterranean Biology
Published by The International Society for Subterranean Biology

A new subspecies of the genus *Duvalius* Delarouzée, 1859 (Coleoptera, Carabidae, Trechini) from western Serbia, with a key and an annotated catalogue of Serbian *Biharotrechus* and *Duvalius* s. str. taxa

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Academic editor: Leonardo Latella | Received 2 October 2021 | Accepted 12 May 2022 | Published 31 May 2022

http://zoobank.org/48C162B1-26CB-4ED9-89E3-2F20BF612F90

Citation: Ćurčić S, Vesović N, Kuraica M, Bosco F, Ćurčić NB, Vrbica M (2022) A new subspecies of the genus *Duvalius* Delarouzée, 1859 (Coleoptera, Carabidae, Trechini) from western Serbia, with a key and an annotated catalogue of Serbian *Biharotrechus* and *Duvalius* s. str. taxa. Subterranean Biology 43: 73–95. https://doi.org/10.3897/subtbiol.43.76049

Abstract

Duvalius semecensis tarensis **ssp. nov.** from two subterranean sites situated on Mt. Tara (western Serbia) is described, illustrated and compared with its most related congeners. It is provisionally placed in the subgenus *Biharotrechus* Bokor, 1922. The new subspecies is characterized by a depigmented, medium-sized body, the presence of reduced eyes, deep and complete frontal furrows, two pairs of discal setae in third elytral striae, as well as by the shape of aedeagus. It inhabits caves on Mt. Tara and is endemic of this mountain. Data on the distribution and bionomy of the new subspecies are given. Its closest relative, *Duvalius* (*Biharotrechus*) *semecensis semecensis* Winkler, 1926, is redescribed and we designated its holotype by monotypy. A key for the identification and an annotated catalogue of Serbian *Biharotrechus* and *Duvalius* s. str. taxa are also provided.

Keywords

Ground beetles, new taxon, Serbian Dinarides, subterranean fauna, Trechinae

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Introduction

The territory of western Serbia is inhabited by a number of mesovoid shallow substratum (MSS)-dwelling and subterranean trechine taxa (Belousov 2017; Hlaváč et al. 2017), but limited to the MSS and certain caves and pits located in the Dinaric mountain chain of Serbia (Ćurčić et al. 2016, 2018a). The hypogean trechine fauna of western Serbia has been studied for almost a century (Jeannel 1923, 1928), but intensive systematic explorations have been conducted in the last two decades, resulting in the descriptions of numerous taxa of the genus *Duvalius* Delarouzée, 1859 new to science (Guéorguiev et al. 2000; Ćurčić et al. 2001, 2003a, 2003b, 2005, 2016; Pavićević and Popović 2001, 2003; Janák and Moravec 2008). Nevertheless, the karstic areas of Mt. Tara and its surroundings in western Serbia are insufficiently biospeleologically investigated so far. Recently, a new genus (*Velesaphaenops* Ćurčić & Pavićević, 2018) and a new species (*V. tarensis* Ćurčić & Pavićević, 2018) of aphaenopsoid trechine beetles were described from a pit on Mt. Tara (Ćurčić et al. 2018a). Another aphaenopsoid trechine beetle, *Acheroniotes lethensis* Ćurčić & Pavićević, 2018, inhabits subterranean habitats in Kamena Gora near Prijepolje (southwestern Serbia) (Ćurčić et al. 2018a).

Several field trips conducted by the third (MK) and the fourth author (FB) at two subterranean sites on Mt. Tara resulted in the discovery of a series of specimens belonging to the genus *Duvalius* Delarouzée, 1859. Subsequent analysis of the beetles yielded that they belong to a *Duvalius* subspecies unknown to science, which is described and diagnosed in this contribution.

Materials and methods

The diagnosis of *Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov. is based on the study of type series, which consists of 13 specimens (two males and 11 females). Specimens were collected by pitfall trapping during 2013, 2014 and 2017 at two subterranean sites on Mt. Tara (an unnamed cave in the village of Solotuša and the pit 4-1-3-27 in the village of Kaluđerske Bare) (Fig. 1). Pitfall traps were baited with rotten meat.

The specimens were studied by the first (SĆ) and the second author (NV) in the laboratory of the Institute of Zoology, University of Belgrade - Faculty of Biology, Belgrade, Serbia. Studied specimens were dissected, analyzed and illustrated. Dry beetles were glued onto separate paper mounting cards. Morphological structures of the beetles were examined using Nikon SMZ 800N and Zeiss Stemi 508 stereomicroscopes. Male and female genitalia were dissected, cleaned in KOH, fixed in a medium consisting of Canada balsam and xylol, mounted on transparent plastic mounting cards and pinned under examined specimens. Macro photographs were taken by a Nikon SMZ 800N stereomicroscope with a Nikon DS-Fi2 digital camera and improved using Adobe Photoshop CS6 software. A Nikon DS-L3 control unit was used for scaling.

The systematics used follow Jeannel (1928), Belousov (2017) and Hlaváč et al. (2017).

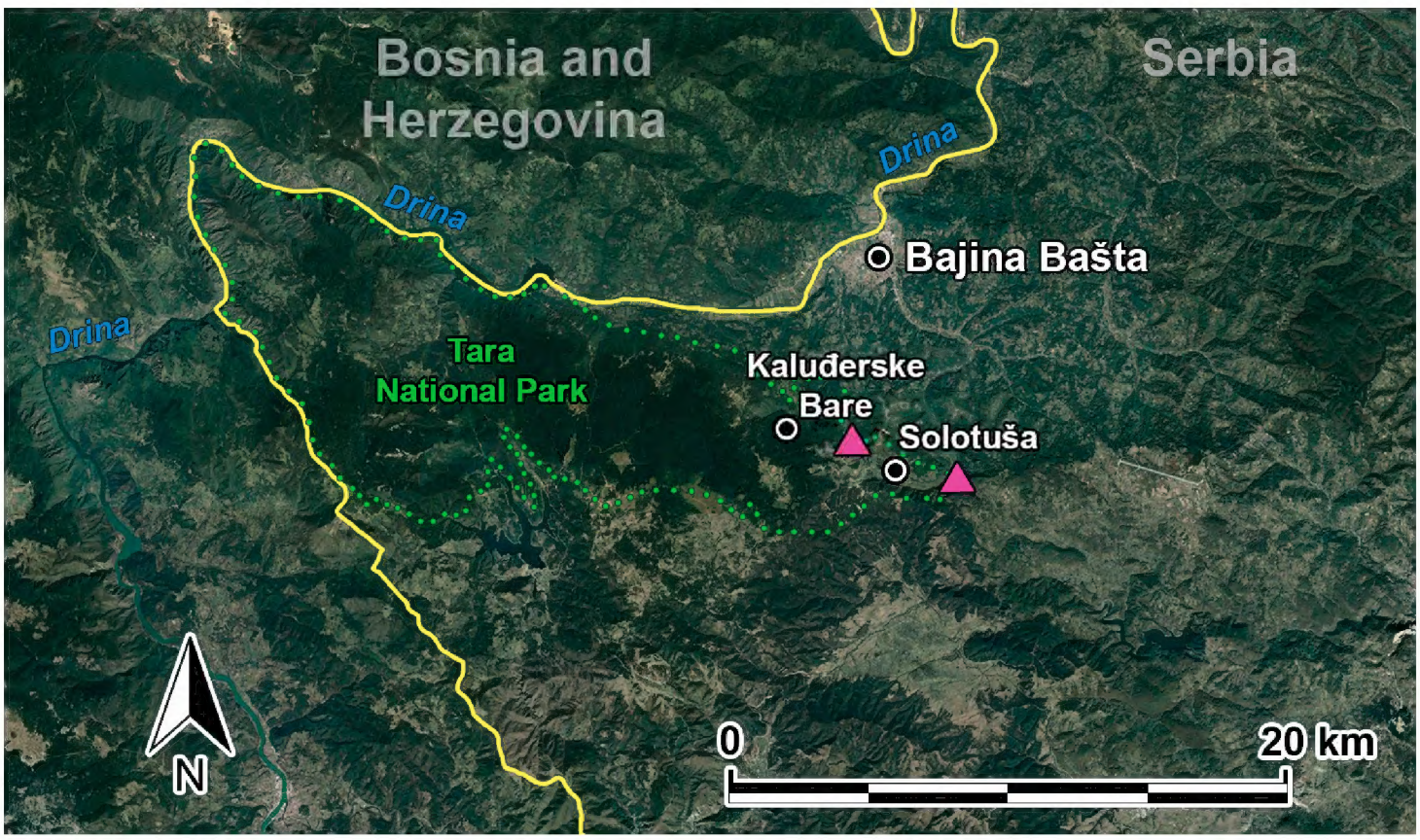

Figure 1. A map of the Tara National Park (western Serbia) with sites (pink triangles) where *Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov. was found.

Abbreviations of measurements

A2L/A2W	ratio of length to width of antennomere 2;
A10L/A10W	ratio of length to width of antennomere 10;
AEL	length of aedeagus;
EL	length of elytra (measured along suture from base to apex);
EL/EW	ratio of length of elytra to maximum width of elytra;
EW	maximum width of elytra;
HL	length of head (measured from the anterior margin of clypeus to neck constriction);
HL/HW	ratio of length of head to maximum width of head;
HW	maximum width of head;
L	overall body length (measured from the apex of mandibles to the apex of elytra along suture);
PL	length of pronotum (measured along median line);
PL/PW	ratio of length of pronotum to maximum width of pronotum as greatest transverse distance;
PW	maximum width of pronotum as greatest transverse distance;
TL	total body length (measured from the anterior margin of clypeus to the apex of elytra along suture).

Collections

CDP	private collection of Dragan Pavićević, Belgrade, Serbia;

INCS collection of the Institute for Nature Conservation of Serbia, Belgrade, Serbia;
IZFB collection of the Institute of Zoology, University of Belgrade - Faculty of Biology, Belgrade, Serbia;
NHMV collection of the Natural History Museum Vienna, Vienna, Austria.

Other abbreviations

AW leg. Augusta Weirather;
BM leg. Bojan Mitić;
DP leg. Dragan Pavićević;
DR leg. Dejan Radović;
ĐM leg. Đorđe Marković;
FB leg. Fabrizio Bosco;
GN leg. Guido Nonveiller;
HT holotype;
ibid. in the same place;
IN leg. Iva Njunjić;
MK leg. Miloš Kuraica;
MKO leg. Marjan Komnenov;
MP leg. Momčilo Popović;
MSS mesovoid shallow substratum;
PT paratype;
SĆ leg. Srećko Ćurčić;
SO leg. Siniša Ognjenović.

Other examined taxa

Duvalius (*Biharotrechus*) *reufi* Pavićević & Popović, 2003: one female, southwestern Serbia, town of Sjenica, Pešter Plateau, village of Ušak, Ušak Cave System, 30.VIII.2002, DP (CDP).

Duvalius (*Biharotrechus*) *semecensis semecensis* Winkler, 1926: HT male, eastern Bosnia and Herzegovina, town of Višegrad, Mt. Sjemeć, village of Đipi, Vrteljka Cave, with no date provided, AW (NHMV).

Duvalius (*Duvalius*) *bolei* Pretner, 1963: two males, four females, southeastern Serbia, town of Svrljig, Svrljiške Planine Mts., village of Prekonoga, Prekonoška Pećina Cave, 10.V–27.X.2004, pitfall traps, SO (CDP); one female, ibid., 11.V.2004, DP (CDP); one male, ibid., 27.X.2004, DP (CDP); one male, ibid., 28.V.2013, ĐM (IZFB).

Duvalius (*Duvalius*) *javorensis* (S. Ćurčić, Brajković & B. Ćurčić, 2003): HT male and four PT females, southwestern Serbia, town of Nova Varoš, Mt. Javor, village of Trudovo, Pećina pod Kapilijama Cave, 20.VIII.2003, SĆ (IZFB); two PT females, ibid., VIII.2002, SĆ & BM (IZFB).

Duvalius (*Duvalius*) *sturanyi sturanyi* (Apfelbeck, 1904): one male, two females, western Serbia, town of Ljubovija, Mt. Bobija, 1,000 m a.s.l., 26.V.1981, GN (CDP); one female, northern Montenegro, town of Žabljak, Mt. Durmitor, Tara River Canyon, Splavište, Pećina nad Splavištem Cave, 2.VII.1991, DP (CDP); three females, southwestern Serbia, town of Prijepolje, village of Babine, Velika Pećina Cave, 1,166 m a.s.l., 25.VII.2009, MKO & MP (CDP); one male, one female, ibid., 6.VII.2010, IN & SO (CDP); two males, ibid., 6.VII.2010–25.XI.2011, pitfall traps, SO & IN (CDP).

Duvalius (*Duvalius*) *suvoborensis* Pavićević & Popović, 2001: HT male and six PT females, western Serbia, town of Valjevo, Mt. Suvobor, Rajac, village of Brezaci, Pećina u Brezacima Cave, 5.VI–3.XII.2002, pitfall traps, DP (INCS, CDP); one male, western Serbia, town of Valjevo, Mt. Suvobor, Ravna Gora, Mokra Pećina Cave, 690 m a.s.l., 6.VI–3.XII.2002, pitfall traps, DP (CDP); one male, western Serbia, town of Valjevo, Mt. Suvobor, Rajac, Mala Bezdan Pit, 15.VIII.2003, pitfall traps, SO (CDP).

Duvalius (*Duvalius*) *suvodolensis* (S. Ćurčić, Brajković & B. Ćurčić, 2003): HT female, southwestern Serbia, town of Nova Varoš, Mt. Javor, village of Debelja, Suvodol valley, 2.V.2003, SĆ, BM & DR (IZFB).

Results

Order Coleoptera Linnaeus, 1758
Family Carabidae Latreille, 1802
Subfamily Trechinae Bonelli, 1810
Tribe Trechini Bonelli, 1810
Genus *Duvalius* Delarouzée, 1859
***Duvalius* (*Biharotrechus*) *semecensis* Winkler, 1926**

***Duvalius* (*Biharotrechus*) *semecensis tarensis* Ćurčić & Vesović, ssp. nov.**

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Figs 2–8

Type material. *Holotype*: male (IZFB) labeled as follows: „WESTERN SERBIA: town of Bajina Bašta, Mt. Tara, village of Solotuša, an unnamed cave, 43°53'46.023"N, 19°36'1.339"E, 20.V–5.XI.2017, pitfall traps, MK“ (white label, printed) / „Holotypus *Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov. Ćurčić & Vesović det. 2021“ (red label, printed) (Fig. 2).

Paratypes (12 specimens). The same data as for HT [seven females, IZFB]; the same data as for HT except for date and collector [two females, IZFB, September, 17, 2013, FB]; one male and one female (IZFB) labeled as follows: „WESTERN SERBIA: town of Bajina Bašta, Mt. Tara, village of Kaluđerske Bare, pit 4-1-3-27, 43°54'30.712"N, 19°33'11.585"E, 20.V–5.XI.2017, pitfall traps, MK“; the same data as for the two preceding PTs except for date and collector [one female, IZFB, July, 5, 2014, FB]. All PTs are labeled with white, printed locality labels and with red printed labels „Paratypus *Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov. Ćurčić & Vesović det. 2021“.

Etymology. The new subspecies is named after its *terra typica* – Mt. Tara in western Serbia.

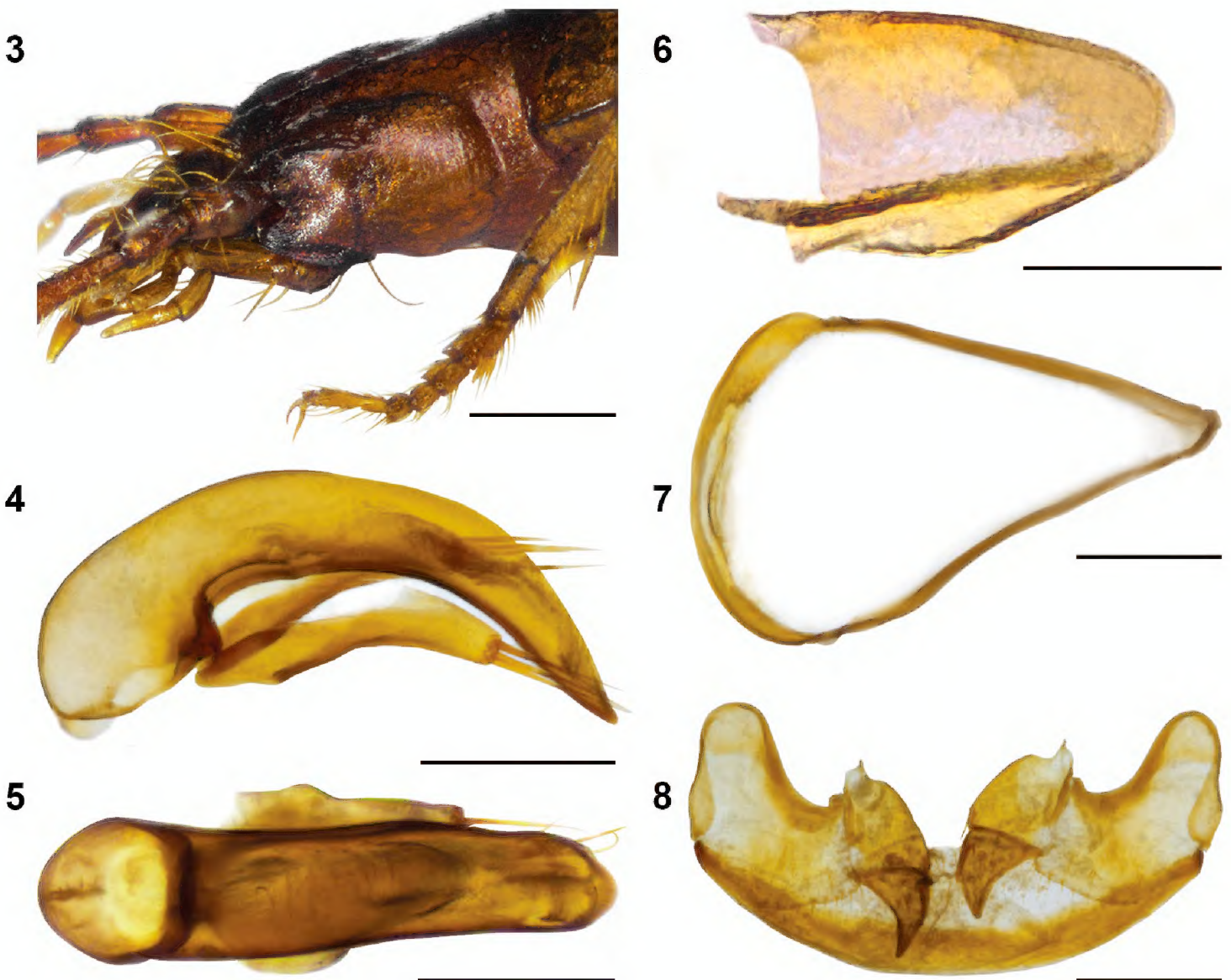
Diagnosis and taxonomical remarks. A medium-sized (TL 4.31–4.67 mm, L 4.83–5.18 mm), glabrous, depigmented trechine beetle with the morphological character states of the subgenus *Biharotrechus*, genus *Duvalius* (see the Discussion). Colour

Figure 2. *Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov. from an unnamed cave, village of Solotuša, near the town of Bajina Bašta, Mt. Tara, western Serbia. HT male, habitus, dorsal aspect. Scale bar: 2 mm.

reddish-brown, head relatively large, rounded, with deep, complete frontal furrows and vestigial eyes. Pronotum transverse, heart-shaped, elytra sub-oval, with two pairs of discal setae (Figs 2, 3).

Duvalius (*Biharotrechus*) *semecensis tarensis* ssp. nov. is most closely related to the nominotypic subspecies of *Duvalius* (*Biharotrechus*) *semecensis* Winkler, 1926 from eastern Bosnia and Herzegovina (cave- and MSS-dwelling, from Mt. Sjemeć, near the town of Višegrad), *Duvalius* (*Biharotrechus*) *reufi* Pavićević & Popović, 2003 from southwestern Serbia (cave-dwelling, from the Pešter Plateau and Mt. Javor, near the towns of Sjenica and Nova Varoš), as well to the following three *Duvalius* species distributed in western and southwestern Serbia: *Duvalius* (*Duvalius*) *suvoborensis* Pavićević & Popović, 2001 (cave-dwelling, from Mt. Suvobor, near the town of Valjevo), *D.* (*D.*) *javorensis* (S. Ćurčić, Brajković & B. Ćurčić, 2003) (cave-dwelling, from Mt. Javor, near the town of Nova Varoš) and *D.* (*D.*) *suvodolensis* (S. Ćurčić, Brajković & B. Ćurčić, 2003) (MSS-dwelling, from Mt. Javor, near the town of Nova Varoš) (Figs 9, 10, 14, 16, 18, 19) (Winkler 1926; Jeannel 1928; Pavićević and Popović 2001, 2003; Ćurčić et al. 2003a, 2003b). All the listed taxa share the following morpho-anatomical features: they possess vestigial eyes, sharp hind pronotal angles and a specific unifid gutter-formed copulatory piece. In *D.* (*B.*) *semecensis tarensis* ssp. nov. elytral base is somewhat oblique and shoulders are sloped and rounded, in *D.* (*B.*) *semecensis semecensis* Winkler, 1926 elytral base is strongly oblique and shoulders are sloped and obtuse, while in the remaining four species elytral base is almost straight and shoulders are elevated and rounded. Other differences between the new subspecies and its most related congeners are listed below.

From the HT of *D.* (*B.*) *semecensis semecensis* it is differed by the TL (4.17 mm vs. 4.31–4.67 mm), length and ratio of length to width of certain antennomeres (antennomere 11 longest, followed by antennomeres 1 and 3, A2L/A2W 1.89, A10L/A10W 2.60 vs. antennomere 3 longest, followed by antennomere 11, A2L/A2W 2.40, A10L/A10W 2.67–2.72), shape of eyes (oval vs. lenticular), number of ommatidia (1–2 vs. 5–8), position of maximum width of pronotum (slightly before anterior third vs. at anterior fourth), shape of lateral pronotal margins before hind pronotal angles (more sinuated vs. less sinuated), shape of lateral pronotal furrows (relatively narrow and shallow vs. wide and deep), position of anterolateral pair of pronotal setae (slightly before anterior third of pronotal length vs. in anterior fifth of pronotal length), shape and ratio of length to width of elytra (more elongate, sub-ovate, EL/EW 1.65 vs. less elongate, sub-oval, EL/EW 1.51–1.60), position of maximum width of elytra (slightly after middle vs. at middle), position of the first pair of elytral discal setae (slightly before level of third humeral seta vs. slightly below level of second humeral seta), position of the second pair of elytral discal setae (after middle vs. at middle or slightly above), shape of median lobe (thinner, more curved, apex more acute in lateral view vs. wider, less curved, apex less acute in lateral view) and basal bulb of aedeagus (moderately elongate, somewhat narrowed distally in lateral view vs. large, rounded) and shape of copulatory piece (edges largely folded dorsally to form a deep cone, without any projection vs. in form of a shallow gutter,



Figures 3–8. *Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov. from Mt. Tara, near the town of Bajina Bašta, western Serbia **3** HT male, head, lateral aspect **4** HT male, aedeagus, lateral aspect **5** HT male, aedeagus, dorsal aspect **6** HT male, copulatory piece, dorsal aspect **7** HT male, abdominal sternite IX (urite) **8** PT female, genitalia, dorsal aspect. Scale bars: 0.5 mm (**3**); 0.2 mm (**4, 5, 7, 8**); 0.1 mm (**6**).

with a longitudinal sclerotized projection, edges not folded and sclerotized) (Table 1, Figs 10, 11) (Winkler 1926; Jeannel 1928).

From *D.* (*B.*) *reufi*, *D.* (*B.*) *semecensis tarensis* ssp. nov. is differed by the body shape (more elongate vs. less elongate), HL/HW (head somewhat longer than wide vs. head wider than long), number of ommatidia (none vs. 5–8), width of genae (wider vs. narrower), antennal length (extending the middle of elytra or longer vs. not reaching the middle of elytra), shape of pronotum (more transverse vs. less transverse), position of maximum width of pronotum (at anterior third vs. at anterior fourth), shape of elytra (sub-parallel vs. sub-oval), shape of the median lobe (more curved, straight in distal half, with rounded apex in lateral view and narrowing distally in dorsal view vs. less curved, curved in distal half, with pointed apex in lateral view and sub-parallel in dorsal view) and basal bulb of aedeagus (elongate, narrowed distally in lateral view vs. large, rounded) and shape of copulatory piece (elongate, narrowed distally, without any projection, deeply incised proximally vs. wide, rounded distally, with a longitudinal sclerotized projection, shallowly incised proximally) (Fig. 14) (Pavićević and Popović 2003).

Table 1. Linear measurements and morphometric ratios of *Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov. and its closest conspecific relative *D.* (*B.*) *semecensis semecensis*.

Character	Subspecies	
	***Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov.**	***Duvalius* (*Biharotrechus*) *semecensis semecensis***
TL*	4.31–4.67	4.17
HL*	0.70–0.75	0.67
HW*	0.80–0.87	0.79
HL/HW	0.85–0.88	0.85
A2L/A2W	2.40	1.89
A10L/A10W	2.67–2.72	2.60
PL*	0.84–0.90	0.83
PW*	0.99–1.07	1.00
PL/PW	0.84–0.85	0.83
EL*	2.46–2.87	2.56
EW*	1.63–1.80	1.55
EL/EW	1.51–1.60	1.65

* – values in mm.

From *D.* (*D.*) *suvoborensis*, *D.* (*B.*) *semecensis tarensis* ssp. nov. is differed by the body shape (more elongate vs. less elongate), HL/HW (head somewhat longer than wide vs. head wider than long), number of ommatidia (about 10 vs. 5–8), antennal length (extending the middle of elytra or longer vs. not reaching the middle of elytra), shape of lateral pronotal margins at largest pronotal width (obtusely rounded vs. regularly rounded), shape of hind pronotal angles (less sharp vs. sharper), shape of the median lobe of aedeagus (apex less distally sub-apically elevated in lateral view vs. apex more distally sub-apically elevated in lateral view) and shape of copulatory piece (sub-parallel, with an obtuse apex, a deeper gutter and without any projection, not incised proximally vs. apically narrowed, with a rounded apex, a shallower gutter and a longitudinal sclerotized projection, shallowly incised proximally) (Fig. 18) (Pavićević and Popović 2001).

From *D.* (*D.*) *javorensis*, the new subspecies is differed by the head size in relation to the body (more voluminous vs. less voluminous), width of genae (wider vs. narrower), antennal length (extending over the middle of elytra vs. not reaching the middle of elytra), number of ommatidia (10–14 vs. 5–8), position of maximum width of pronotum (at anterior third vs. at anterior fourth) and elytra (below middle vs. at middle), shape of the median lobe of aedeagus (more robust, not narrowing apically, apex obtuse in dorsal view vs. less robust, narrowing apically, apex rounded in dorsal view) and shape of copulatory piece (sub-parallel, with an obtuse apex, a deeper gutter and without any projection vs. apically narrowed, with a rounded apex, a shallower gutter and a longitudinal sclerotized projection) (Fig. 16) (Ćurčić et al. 2003b).

From *D.* (*D.*) *suvodolensis*, *D.* (*B.*) *semecensis tarensis* ssp. nov. is differed by the HL/HW (head somewhat longer than wide vs. head wider than long), number of ommatidia (about 17 vs. 5–8), shape of lateral elytral margins (arcuate, sub-parallel vs. rounded) and position of maximum width of elytra (below middle vs. at middle) (Fig. 19) (Ćurčić et al. 2003a).

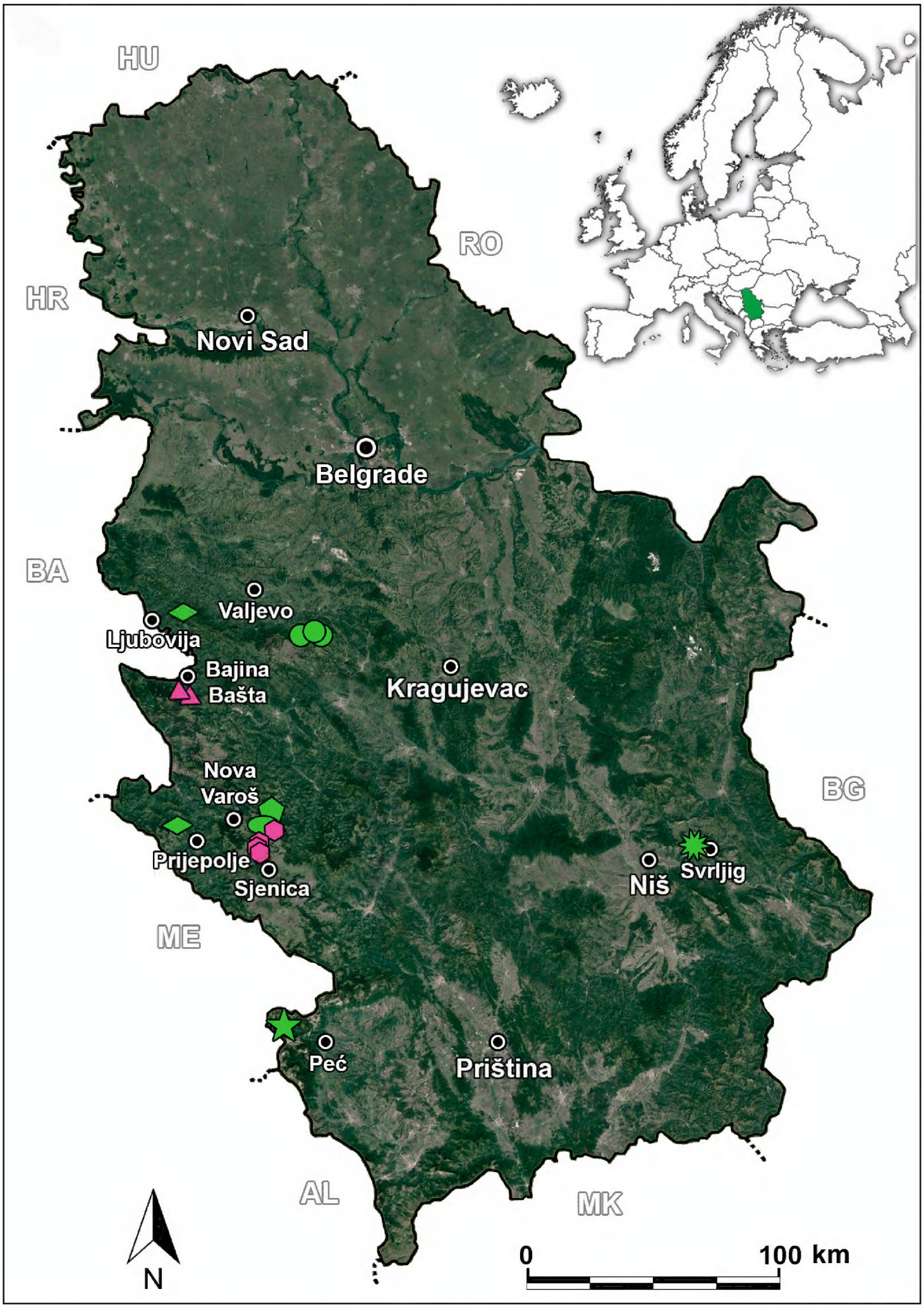


Figure 9. A map of Serbia with sites where *Biharotrechus* (in lime green colour) and *Duvalius* s. str. taxa (in pink colour) were recorded **circle** *D.* (*D.*) *suvoborensis* **ellipse** *D.* (*D.*) *suvodolensis* **hexagon** *D.* (*B.*) *reufi* **pentagon** *D.* (*D.*) *javorensis* **rhombus** *D.* (*D.*) *sturanyi sturanyi* **star** *D.* (*D.*) *leonhardi matejkai* **sun** *D.* (*D.*) *bolei* **triangle** *D.* (*B.*) *semecensis tarensis* ssp. nov. **AL** Albania **BA** Bosnia and Herzegovina **BG** Bulgaria **HR** Croatia **HU** Hungary **ME** Montenegro **MK** North Macedonia **RO** Romania.

Description. Medium-sized. TL 4.31–4.67 mm (HT 4.51 mm), L 4.83–5.18 mm.

***Habitus*:** Body elongate. Colour reddish-brown. Legs and palpi paler.

***Integument*:** Smooth, lustrous, both head and pronotum with a distinct isodiametric microsculpture, while microsculpture of elytra with both isodiametric and transverse meshes.

***Head*:** Relatively large, around as long as 1/6 of TL, rounded (Fig. 2), distinctly narrower than pronotum, glabrous. Genae rounded. Neck well-developed. HL 0.70–0.75 mm (HT 0.72 mm), HW 0.80–0.87 mm (HT 0.82 mm), HL/HW 0.85–0.88 (HT 0.87). Frontal furrows complete, deep, reaching neck constriction. Two pairs of supraorbital setae present, anterior pair situated at level of reduced eyes, posterior pair near frontal furrows. Mandibles relatively long and thin, sharply pointed, right one with a retinaculum. Labrum emarginate, with three pairs of setae. Clypeus with two pairs of setae. Eyes are strongly reduced, lenticular, whitish, darkly bordered (Fig. 3), composed of a few (5–8) ommatidia. Antennae are long and slender, densely pubescent, reaching almost half of elytral length when stretched backward. Antennomere 3 longest, followed by antennomere 11, antennomere 2 shortest (A2L/A2W 2.40), scape and antennomeres 4–10 nearly equally long, A10L/A10W 2.67–2.72.

***Thorax*:** Pronotum glabrous, transverse, cordiform (Fig. 2), slightly wider than long, with maximum width at anterior fourth, at anterior margin wider than at pronotal base. PL 0.84–0.90 mm (HT 0.90 mm), PW 0.99–1.07 mm (HT 1.06 mm), PL/PW 0.84–0.85 (HT 0.85). Lateral margins rounded anteriorly, sinuated before hind angles. Anterior angles are rounded and obtuse, while posterior angles are sharp and pointed. Lateral furrows are wide and deep, with two pairs of setae. Anterolateral pair of setae situated in the anterior fifth of pronotal length, basolateral pair of setae before hind angles. Median furrow is well-developed, deep, visible on almost whole pronotum. Disc weakly convex.

***Elytra*:** Elongate, sub-oval, glabrous, with maximum width at the middle, apically rounded (Fig. 2). EL 2.46–2.87 mm (HT 2.70 mm), EW 1.63–1.80 mm (HT 1.79 mm), EL/EW 1.51–1.60 (HT 1.60). Elytral base oblique. Shoulders rounded, sloped. Scutellum small, sub-triangular, with one pair of scutellar setae. Elytral striae 1–5 well-developed, deep, outer striae reduced to rows of foveae. Punctuation on striae dense and deep. Elytral stria 3 with two discal setae and one apical seta. First discal seta slightly below the level of second humeral seta. Second discal seta around the middle of elytra or slightly above. Intervals are somewhat convex (inner intervals more than outer ones). Disc weakly convex, almost flattened. The umbilicate series consists of eight setae on each elytron (four humeral, two median and two apical), while the humeral group of umbilicate pores is aggregated.

***Legs*:** Long, slender, densely pubescent (Fig. 2), each protibia dorsally with a deep longitudinal fissure. The first two tarsomeres of male protarsi are distinctly dilated and toothed at the internal margin. The first male protarsomere is longer than wide. Tarsal claws are long and slender, pointed at the apex.

***Abdomen*:** Ventrites 4–6 and anal ventrite are glabrous, each with one pair of setae posteriorly. Male abdominal sternite IX (urite) large, sub-triangular (Fig. 7).

***Male genitalia*:** Aedeagus (Figs 4, 5) moderately long, AEL 0.59 mm (HT 0.59 mm). The median lobe is regularly curved and gradually narrowed apically in

lateral view (Fig. 4), while almost straight, sub-parallel, with a rounded apex in dorsal view (Fig. 5). The basal bulb is relatively large (Figs 4, 5) and rounded in lateral view (Fig. 4). The copulatory piece is short, wide, unifid, in form of a shallow gutter with a longitudinal projection, rounded distally and shallowly incised proximally, weakly sclerotized except its edges and longitudinal projection (Fig. 6). The parameres are thin, each shorter than a half of aedeagus length, with four thick apical setae (Figs 4, 5).

***Female genitalia*:** As presented in Fig. 8. Gonocoxites IX are relatively short and wide, curved, gradually narrowed apically, and basally joined with rounded, somewhat elongate gonosubcoxites IX.

Geographic distribution. So far known only from a cave and a pit, both situated on Mt. Tara (see the Type material). We assume that the subspecies could inhabit other caves and pits, as well as MSS on the same mountain and in its surroundings.

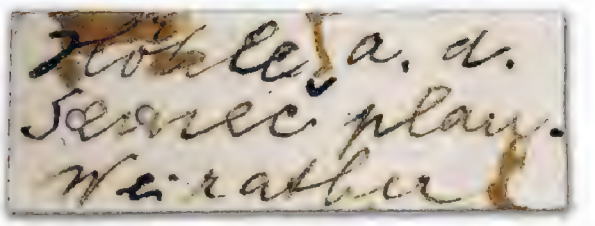
Bionomy and habitat. All specimens of *D.* (*B.*) *semecensis tarensis* ssp. nov. were collected by pitfall traps, both from the floor and walls in the innermost part of an unnamed cave in the village of Solotuša, and at the bottom of the pit 4-1-3-27 in the village of Kaluđerske Bare, in both cases in total darkness, at high humidity, and with the occurrence of trickling water. Pit 4-1-3-27 is the type locality of two additional subterranean beetle taxa – the leiodids *Pholeuonopsis* (*Pholeuonopsis*) *tarensis* Ćurčić & Pavićević, 2018 (Ćurčić et al. 2018b) and *Proleonhardella* (*Proleonhardella*) *tarensis* Ćurčić & Pavićević, 2021 (Ćurčić et al. 2021).

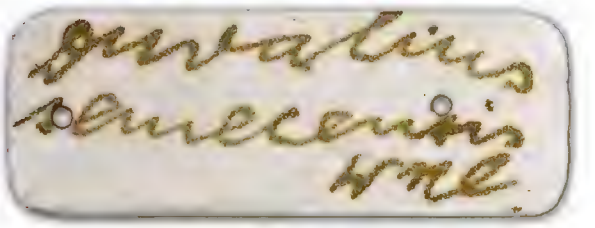
Duvalius (*Biharotrechus*) *semecensis semecensis* Winkler, 1926

Figs 10, 11

Type material. *Holotype* (*by monotypy*): male (NHMV) labeled as follows: „Höhle a. d. Semeč plan., Weirather", with no date provided (white label, handwritten) / „*Duvalius semecensis* Wnl." (white label, handwritten) / „Holotypus *Duvalius* (*Biharotrechus*) *semecensis* Winkler, 1926 Ćurčić det. 2021" (red label, printed) (Fig. 10).

Remarks. For the purpose of comparisons, we studied one male specimen of *D.* (*B.*) *semecensis* borrowed from the NHMV, labeled as „Höhle a. d. Semeč plan. Weirather / *Duvalius semecensis* Wnl." (Figs 10–13), but with no red type label added. The handwriting on both white labels appears to be that of Albert Winkler (Figs 12, 13). According to the available data (H. Schillhammer, pers. comm.), all red type labels in the collection of Albert Winkler that belong to the NHMV have been added subsequently. It seems that Winkler didn't add red type labels for his type specimens. In the original description of *D.* (*B.*) *semecensis*, it was indicated that Augusta Weirather collected one male specimen in an unnamed cave on Mt. Sjemeć in eastern Bosnia and Herzegovina (Winkler 1926). As the type series consists of only one male specimen with the same locality data, we designate the male specimen from the NHMV as the HT by monotypy of *D.* (*B.*) *semecensis*. According to Pretner (2011), who decoded the list of the cave and above-ground collecting sites visited by Weirather, the right name of the type locality of this taxon is the Vrteljka Cave, which is situated in the village





Figures 10–13. *Duvalius* (*Biharotrechus*) *semecensis semecensis* from the Vrteljka Cave, village of Đipi, near the town of Višegrad, Mt. Sjemeć, eastern Bosnia and Herzegovina **10** HT male, habitus, dorsal aspect **11** HT male, head, lateral aspect **12** locality data label of HT male **13** taxonomic name label of HT male. Scale bars: 2 mm (**10**); 0.5 mm (**11**).

of Đipi (43°44'35"N, 19°11'2"E) on Mt. Sjemeć, near the town of Višegrad, eastern Bosnia and Herzegovina. As we noted certain morphological intraspecific differences between the HT of *D.* (*B.*) *semecensis* from the NHMV and *D.* (*B.*) *semecensis tarensis* ssp. nov., the need of establishing nominotypical subspecies [*D.* (*B.*) *semecensis semecensis*] of *D.* (*B.*) *semecensis* has arisen.

After reading both the original description of *D.* (*B.*) *semecensis* by Winkler (1926) and its subsequent description by Jeannel (1928) and a careful examination of the HT of *D.* (*B.*) *semecensis*, we realized that some data on the morphology of the specimen listed in the previous literature do not correspond with the features of the observed male specimen. Namely, Jeannel (1928) reported that the head of *D.* (*B.*) *semecensis semecensis* is remarkably narrow, longer than wide, while Winkler (1926) didn't mention this in the description. The former author claimed that its pronotum is narrow, not wider than long, while the second author wrote that its pronotum is slightly wider than long. Both authors said that both discal setae are situated in fourth elytral intervals. Additionally, Jeannel's drawing of the specimen (Jeannel 1928) is not perfect as it doesn't reflect its true shape (especially the head). Indeed, in the studied HT male, both head and pro-

notum are transverse, and the second discal seta is in the third stria (as was drawn by Jeannel 1928) (Table 1, Fig. 10). For these reasons, we decided to redescribe the HT of *D.* (*B.*) *semecensis semecensis* and to add here additional data on its morphology.

Redescription. Medium-sized. TL 4.17 mm, L 4.40 mm.

***Habitus*:** Body elongate. Colour reddish-brown. Legs and palpi paler.

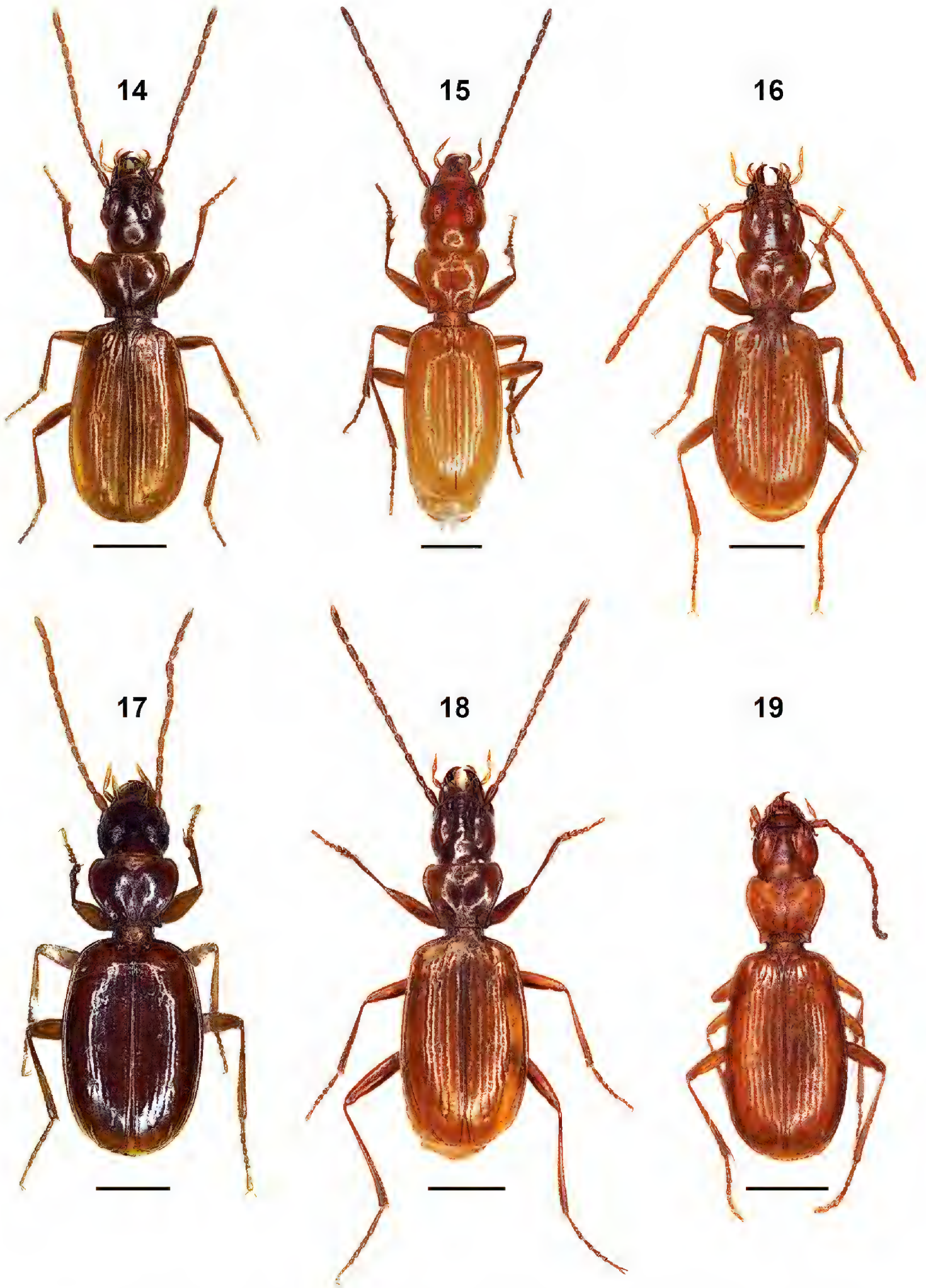
***Integument*:** Smooth, lustrous, head with a distinct isodiametric microsculpture, while microsculpture of both pronotum and elytra possesses both transverse and isodiametric meshes.

***Head*:** Relatively large, around as long as 1/6 of TL, rounded (Fig. 10), narrower than pronotum, glabrous. Genae are rounded. Neck well-developed. HL 0.67 mm, HW 0.79 mm, HL/HW 0.85. Frontal furrows complete, deep, reaching neck constriction. Two pairs of supraorbital setae present, the anterior pair situated at the level of reduced eyes, while the posterior pair is near frontal furrows. Mandibles are thin, relatively long, sharply pointed, right one with a retinaculum. Labrum is deeply emarginate, with three pairs of setae. Clypeus is with two pairs of setae. Eyes are strongly reduced, oval, whitish, darkly bordered (Fig. 11), composed of 1–2 ommatidia. Antennae thin, long, haired, reaching almost half of elytral length when stretched backward. Antennomere 11 longest, followed by equally long antennomeres 1 and 3, antennomere 2 shortest (A2L/A2W 1.89), antennomeres 4 and 6–10 of similar length, antennomere 5 somewhat longer, A10L/A10W 2.60.

***Thorax*:** Pronotum glabrous, transverse, cordiform (Fig. 10), slightly wider than long, with maximum width slightly before anterior third, at anterior margin wider than at pronotal base. PL 0.83 mm, PW 1.00 mm, PL/PW 0.83. Lateral margins rounded anteriorly, sinuated before hind angles. Anterior angles are rounded and obtuse. Posterior angles are sharp and pointed. Lateral furrows are relatively narrow and shallow, with two pairs of setae. Anterolateral pair of setae situated slightly before the anterior third of pronotal length, basolateral pair of setae before hind angles. Median furrow is well-developed, deep and long. Disc weakly convex.

***Elytra*:** Elongate, sub-ovate, glabrous, with maximum width slightly after middle, apically rounded (Fig. 10). EL 2.56 mm, EW 1.55 mm, EL/EW 1.65. Elytral base oblique. Shoulders are somewhat prominent, obtuse and sloped. Scutellum is small, sub-triangular, with one pair of scutellar setae. Elytral striae 1–5 well-developed, deep, outer striae reduced to rows of foveae. Punctuation on striae dense and deep. First discal seta is in fourth interval, second discal seta is in third stria, while apical seta is positioned at place where second and third striae coalesce, slightly below the level of second humeral seta. First discal seta slightly before the level of third humeral seta. Second discal seta after the middle of elytra. Intervals are slightly convex (inner intervals more than outer ones). Disc relatively convex. The umbilicate series consists of eight setae on each elytron (four humeral, two median and two apical), while the humeral group of umbilicate pores is aggregated.

***Legs*:** Elongate, thin, densely pubescent (Fig. 10), each protibia dorsally has a deep longitudinal fissure. The first two protarsomeres in the male are distinctly dilated and



Figures 14–19. Habitus (dorsal aspect) of the taxa of *Biharotrechus* and *Duvalius* s. str. from Serbia **14** *D.* (*B.*) *reufi* **15** *D.* (*D.*) *bolei* **16** *D.* (*D.*) *javorensis* **17** *D.* (*D.*) *sturanyi sturanyi* **18** *D.* (*D.*) *suvoborensis* **19** *D.* (*D.*) *suvodolensis*. Scale bars: 1 mm.

toothed at the internal margin. The first male protarsomere is longer than wide. Tarsal claws are long, thin, pointed apically.

***Abdomen*:** Ventrites 4–6 and anal ventrite are glabrous, each with one pair of setae posteriorly. Male abdominal sternite IX (urite) missing, previously extracted from the male specimen.

***Male genitalia*:** Aedeagus missing, previously extracted from the male specimen.

***Female genitalia*:** Unknown.

Geographic distribution. So far known from its type locality (Vrteljka Cave) situated on Mt. Sjemeć. Eric Quéinnec (pers. comm.) collected specimens of the same taxon in MSS in the surroundings of the type locality, at both sides of the Drina River, close to the town of Višegrad in eastern Bosnia and Herzegovina.

Discussion

The geographic range of the trechine genus *Duvalius* is large. It ranges from the Iberian Peninsula in the west to China in the east, as well as from central Europe in the north to northern Africa in the south. Its highest diversity is observed in the Apennine and the Balkan Peninsulas, as well as in the Alps (Jeannel 1928; Belousov 2017). This genus is exceptionally diverse and highly polymorphic and includes principally small- to medium-sized taxa (Jeannel 1928; Lorenz 2005; Belousov 2017). Their pigmentation is mostly absent, but certain taxa are pigmented. Eyes can be differently developed – lacking, reduced, or functional. Most *Duvalius* representatives are associated with subterranean habitats (chiefly caves and soil) (Jeannel 1928).

The genus *Duvalius* in the Balkan Peninsula, including Serbia, contains a high number of taxa (Lorenz 2005; Belousov 2017). The validity of some recently described taxa has been widely discussed by Lohaj et al. (2013) and Ćurčić et al. (2013). Some of them were in the past placed in newly established genera (Ćurčić et al. 2001; Ćurčić et al. 2003a, 2003b), which were later synonymized (Lohaj et al. 2013). Ćurčić et al. (2013) re-erected those to the genus level. Most authors treat the genus as a monophyletic unit (Casale et al. 2013; Faille et al. 2013; Lohaj et al. 2013), as was previously established by Jeannel (1928), but the support of this branch is not yet proven (and probably depends on the taxonomic sampling used). Namely, the monophyly of different *Duvalius* subgenera was not supported so far (Faille et al. 2013) and the organization within this group remains to be refined. Eric Quéinnec (pers. comm.) considers the genus *Duvalius* monophyletic and probably a sister group to the genus *Anophthalmus* Sturm, 1844, but thinks that the current subdivision of *Duvalius* into subgenera will probably be debatable as the boundaries of subgenera are not yet clear. However, Ćurčić et al. (2013) are of opinion that *Duvalius* contains a number of genera based on the heterogeneity of morphological features of species ascribed to the genus. It is very important to elucidate the phylogenetic position of *Duvalius* subgenera and species groups, as well as of the related genera in the Balkans in the future because phylogenetic relationships among different taxa of *Duvalius* in this area still remained

unclear. It is essential to conduct further molecular phylogenetic studies, which are independent of the subjectivity of taxonomists (contrary to the classical morphological and morphometric observations that depend on the subjective view of taxonomists).

According to morphological features, *Duvalius semecensis tarensis* ssp. nov. is provisionally ascribed to *Biharotrechus* Bokor, 1922 rather than to *Duvalius* s. str. as it predominantly shares morphological characters specific to the former subgenus. This might also concern *D.* (*D.*) *javorensis*, *D.* (*D.*) *suvoborensis* and *D.* (*D.*) *suvodolensis*, which seem to form a homogeneous group of closely related species, but it must be first supported by morphological analyses of the copulatory piece [the case of *D.* (*D.*) *suvodolensis*] and desirably by molecular studies. According to the shape of the copulatory piece, the new subspecies is close to *Duvalius* str. representatives. Namely, lateral phaneres in *D.* (*B.*) *semecensis tarensis* ssp. nov. are reaching the apex of the copulatory piece, while these structures in *Biharotrechus* spp. are short (Jeannel 1928), indicating that the subgenus *Biharotrechus* has very debatable morphological characters and is probably questionable.

In total, seven taxa of *Duvalius* s. str. and one taxon of *Biharotrechus* currently occur in Serbia (Fig. 9). As indicated in the differential diagnosis, *D.* (*B.*) *semecensis tarensis* ssp. nov. is most closely related to *D.* (*B.*) *semecensis semecensis* (inhabiting eastern Bosnia and Herzegovina), *D.* (*B.*) *reufi* (from southwestern Serbia), as well as to *D.* (*D.*) *suvoborensis*, *D.* (*D.*) *javorensis* and *D.* (*D.*) *suvodolensis* (inhabiting western and southwestern Serbia). Jeannel (1928) placed *D.* (*B.*) *semecensis* into the "*Duvalius pilifer*" species group (anophthalmous, convex *Biharotrechus* spp. with a deep fissure on the protibia, living in the Dinarides and the Hellenides), but it seems that the former taxon is not related to the "*D. pilifer*" group, which contains species with very particular morphology.

Duvalius (*D.*) *suvoborensis*, *D.* (*D.*) *javorensis* and *D.* (*D.*) *suvodolensis* likely belong to a separate group of species as they share numerous morpho-anatomical features (reduced eyes, complete and deep frontal furrows, smooth genae, the specific position of the humeral setae and the similar shape of the copulatory piece) (Pavićević and Popović 2001; Ćurčić et al. 2003a, 2003b). They were even the members of a single genus – *Javorella* S. Ćurčić, Brajković & B. Ćurčić, 2003 (Ćurčić et al. 2003a, 2003b). The species *Duvalius* (*Duvalius*) *bolei* Pretner, 1963 has a specific position within the subgenus *Duvalius* s. str. and is not closely related to *D.* (*B.*) *semecensis tarensis* ssp. nov. The former taxon is the only *Duvalius* s. str. species distributed in the Carpatho-Balkanides of Serbia. Pretner (1963) was aware of the supraspecific position of the taxon and assumed that it might belong to a separate subgenus of *Duvalius*. Based on the characteristic shape of the head, the absence of longitudinal furrows on the fore tibias, the peculiar shape of the aedeagus and the specific form of the copulatory piece, Ćurčić and Brajković (2003) placed the taxon in the newly established genus *Curcicia* Ćurčić & Brajković, 2003.

The Serbian taxa of the subgenera *Biharotrechus* and *Duvalius* s. str. can be separated using the identification key below, followed by their catalogue, including data on their type localities, other localities in Serbia, distribution and short notes.

A provisional key for the identification of the taxa of *Biharotrechus* and *Duvalius* s. str. of Serbia

1 Eyes developed, both cave- and MSS-dwelling taxa, inhabiting the Dinarides in western and southwestern Serbia **2**

– Eyes completely missing, cave-dwelling species, inhabiting the Carpatho-Balkanides in southeastern Serbia ..... ***D.* (*D.*) *bolei* Pretner, 1963**

2 Pigmented taxa, eyes fully functional, numerous discal setae in the third elytral striae **3**

– Depigmented taxa, eyes reduced, composed of a few ommatidia, two discal setae in the third elytral striae **4**

3 Body longer (TL 5.0 mm), eyes more prominent, fifth elytral striae with 1–2 discal setae, more strongly impressed, lateral pronotal margins somewhat arcuate medially ..... ***D.* (*D.*) *leonhardi matejkai* Mařan, 1939**

– Body shorter (TL 4.5 mm), eyes less prominent, fifth elytral striae with no discal setae, less impressed, lateral pronotal margins more rounded..... ..... ***D.* (*D.*) *sturanyi sturanyi* (Apfelbeck, 1904)**

4 Elytral base oblique, shoulders sloped, inhabiting Bosnia and Herzegovina and Serbia [*D.* (*B.*) *semecensis* Winkler, 1926] **5**

– Elytral base almost straight, shoulders elevated..... **6**

5 Antennomere 2 shorter (A2L/A2W 1.89), the maximum width of pronotum slightly before the anterior third, elytra sub-ovate, more elongate, widest below the middle, shoulders obtuse, copulatory piece with a deeper gutter and without any projection, inhabiting Mt. Sjemeć (eastern Bosnia and Herzegovina) .... ***D.* (*B.*) *semecensis semecensis* Winkler, 1926**

– Antennomere 2 longer (A2L/A2W 2.40), the maximum width of pronotum at the anterior fourth, elytra sub-oval, less elongate, widest at the middle, shoulders rounded, copulatory piece with a shallower gutter and a longitudinal sclerotized projection, inhabiting Mt. Tara (western Serbia)..... ***D.* (*B.*) *semecensis tarensis* ssp. nov.**

6 Head subglobose, slightly narrower than pronotum 7

– Head elongate, distinctly narrower than pronotum **8**

7 Body more elongate, longer (TL 4.33–5.02 mm), head more voluminous, antennae longer, lateral elytral margins rounded, cave-dwelling species..... ..... ***D.* (*D.*) *javorensis* (S. Ćurčić, Brajković & B. Ćurčić, 2003)**

– Body less elongate, shorter (TL 4.19 mm), head less voluminous, antennae shorter, lateral elytral margins arcuate, sub-parallel, MSS-dwelling species .... ***D.* (*D.*) *suvodolensis* (S. Ćurčić, Brajković & B. Ćurčić, 2003)**

8 Eyes with about 10 ommatidia, shoulders less elevated, the median lobe of aedeagus narrower and less curved in lateral view, copulatory piece sub-parallel, not incised proximally, inhabiting Mt. Suvobor ..... ***D.* (*D.*) *suvoborensis* Pavićević & Popović, 2001**

– Eyes with no ommatidia, shoulders more elevated, the median lobe of aedeagus wider and more curved in lateral view, copulatory piece triangular, deeply incised proximally, inhabiting the Pešter Plateau and Mt. Javor .... ***D.* (*B.*) *reufi* Pavićević & Popović, 2003**

An annotated catalogue of the taxa of *Biharotrechus* and *Duvalius* s. str. from Serbia

1. ***Duvalius* (*Biharotrechus*) *semecensis tarensis* ssp. nov.** (Fig. 2)
   Type locality: An unnamed cave, village of Solotuša, near the town of Bajina Bašta, Mt. Tara, western Serbia.
   Other localities in Serbia: Pit 4-1-3-27, village of Kaluđerske Bare, near the town of Bajina Bašta, Mt. Tara, western Serbia.
   Distribution: Serbia, Mt. Tara (cave-dwelling).

2. ***Duvalius* (*Biharotrechus*) *reufi*** Pavićević & Popović, 2003: 195 (*Duvalius*) (Fig. 14)
   Type locality: Ušak Cave System, village of Ušak, near the town of Sjenica, Pešter Plateau, southwestern Serbia.
   Other localities in Serbia: Tubića Pećina Cave, village of Tubići, near the town of Sjenica, Pešter Plateau, southwestern Serbia; Baždarska Pećina Cave, village of Ursule, near the town of Sjenica, Pešter Plateau, southwestern Serbia; Bukovik Cave, village of Ljepojevići, near the town of Nova Varoš, Mt. Javor, southwestern Serbia.
   Distribution: Serbia, Pešter Plateau and Mt. Javor (cave-dwelling).

3. ***Duvalius* (*Duvalius*) *bolei*** Pretner, 1963: 144 (*Duvalius*) (Fig. 15)
   Type locality: Prekonoška Pećina Cave, village of Prekonoga, near the town of Svrljig, Svrljiške Planine Mts., southeastern Serbia.
   Other localities in Serbia: None.
   Distribution: Serbia, Svrljiške Planine Mts. (cave-dwelling).

4. ***Duvalius* (*Duvalius*) *javorensis*** S. Ćurčić, Brajković & B. Ćurčić, 2003: 16 (*Javorella*) (Fig. 16)
   Type locality: Pećina pod Kapilijama Cave, village of Trudovo, near the town of Nova Varoš, Mt. Javor, southwestern Serbia.
   Other localities in Serbia: None.
   Distribution: Serbia, Mt. Javor (cave-dwelling).
   Note: Belousov (2017) erroneously added Bojan Mitić as one of the authors of this species.

5. ***Duvalius* (*Duvalius*) *leonhardi matejkai*** Mařan, 1939: 60 (*Duvalius*)
   Type locality: Mt. Čakor, Prokletije Mts., eastern Montenegro and southwestern Serbia.
   Other localities in Serbia: None.
   Distribution: Montenegro and Serbia, Mt. Čakor (MSS-dwelling).
   Note: Hlaváč et al. (2017) didn't include this subspecies in their catalogue. They presented data only on the nominotypic subspecies of *Duvalius* (*Duvalius*) *leonhardi* (Reitter, 1901). Belousov (2017) reported the presence of *D.* (*D.*) *leonhardi matejkai* for Montenegro only. As its type locality (Mt. Čakor) is

situated on the border between Montenegro and Serbia (Province of Kosovo and Metohija), it has to be accounted for Serbia as well.

6. ***Duvalius* (*Duvalius*) *sturanyi sturanyi*** Apfelbeck, 1904: 136 (*Trechus*) (Fig. 17)

Type locality: By a small mountain stream, near the town of Foča, southeastern Bosnia and Herzegovina.

Localities in Serbia: Mt. Bobija, near the town of Ljubovija, western Serbia; Velika Pećina Cave, village of Babine, near the town of Prijepolje, southwestern Serbia.

Distribution: Bosnia and Herzegovina, Montenegro and Serbia (MSS- and cave-dwelling).

Note: Contrary to Hlaváč et al. (2017), it seems that Belousov (2017) wasn't aware of the data published in Nonveiller (1983) and Pavićević et al. (2012), who reported the presence of the nominotypic subspecies of *Duvalius* (*Duvalius*) *sturanyi* (Apfelbeck, 1904) at two sites in Serbia in the vicinity of the towns of Ljubovija and Prijepolje.

7. ***Duvalius* (*Duvalius*) *suvoborensis*** Pavićević & Popović, 2001: 28 (*Duvalius*) (Fig. 18)

Type locality: Pećina u Brezacima Cave, village of Brezaci, Rajac, near the town of Valjevo, Mt. Suvobor, western Serbia.

Other localities in Serbia: Mala Bezdan Pit, Rajac, town of Valjevo, Mt. Suvobor, western Serbia; Mokra Pećina Cave, Ravna Gora, town of Valjevo, Mt. Suvobor, western Serbia.

Distribution: Serbia, Mt. Suvobor (cave-dwelling).

Note: Belousov (2017) wrote that this species was described in 2003, but actually it happened in 2001. Aside its type locality, we report here its records from two additional cave sites situated on Mt. Suvobor.

8. ***Duvalius* (*Duvalius*) *suvodolensis*** S. Ćurčić, Brajković & B. Ćurčić, 2003: 113 (*Javorella*) (Fig. 19)

Type locality: Valley Suvodol, village of Debelja, near the town of Nova Varoš, Mt. Javor, southwestern Serbia.

Other localities in Serbia: None.

Distribution: Serbia, Mt. Javor (MSS-dwelling).

Note: Belousov (2017) mentioned that the species lives in Armenia, but it inhabits Serbia only.

Acknowledgements

The study was financially supported by the Serbian Ministry of Education, Science and Technological Development (Contracts Nos. 451-03-68/2022-14/200178 and 451-03-68/2022-14/200172). We are thankful to Mr Đorđe Marković (Tel Aviv, Israel) and Mr Matija Petković (Belgrade, Serbia), who helped us during field research. We are also grateful to Mr Dragan Pavićević (Belgrade, Serbia), who kindly allowed us

to study and photograph certain *Duvalius* species from his collection. We are especially indebted to Dr Harald Schillhammer (Natural History Museum Vienna, Vienna, Austria), who kindly loaned the type material of some ground beetle taxa. Last but not least, we are grateful to Dr Snežana Pešić (Kragujevac, Serbia), Dr Eric Quéinnec (Paris, France) and Dr Pier Mauro Giachino (Turin, Italy), whose opinions, useful suggestions and constructive remarks significantly contributed to the improvement of earlier versions of the manuscript.

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